# HABITAT SELECTION BY THE AMERICAN KESTREL (*Falco sparverious*) AND RED-TAILED HAWK (*Buteo jamaicensis*) WINTERING IN MADISON COUNTY, KENTUCKY

Nancy J. Sferra

Abstract - Habitat selection by the American Kestrel (*Falco sparverius*) and Red-tailed Hawk (*Buteo jamaicensis*) in Madison County, Kentucky, was determined for the winter of 1980-81. Results showed that there was significant non-random use of 6 habitat types (Kestrels: $\chi^2 = 629.5$, $P < 0.05$, d.f. = 5; Red-tailed Hawks: $\chi^2 = 124.8$, $P < 0.05$, d.f. = 5) with old field sites being used most frequently by both species.

The American Kestrel (*Falco sparverius*) and Red-tailed Hawk (*Buteo jamaicensis*) are the most numerous diurnal raptors wintering in Madison County (Sferra 1984). Mengel (1965) reported that, in Kentucky, kestrels preferred open areas. Along highways in West Virginia, kestrels most often hunted in pasturelands, or open areas planted with *Lespedeza* spp. (Ferris 1974). However, near highways in the Texas panhandle, kestrels frequented wooded areas (Allan and Sime 1943).

Red-tailed Hawks were most commonly associated with woodlots in Iowa and the Texas panhandle (Allan and Sime 1943; Weller 1964). Petersen (1979) reported that Red-tailed Hawks seldom used internal portions of woodlots, supporting Schnell's (1968) observation that the species preferred perching at woodlot edges. In Michigan, open areas were heavily utilized (Craighead and Craighead 1956), lone trees being favored as perch sites (Chamberlain 1974).

High winter densities of these raptors in Madison County (Sferra 1984) may result from the amount of open habitat available for hunting, as well as the presence of adjacent, heterogeneous edge habitat. Many open areas are bordered by fencerows of trees or are bisected by power lines, providing perching sites from which hawks can search for prey. The purpose of the present study was to determine the relative extent to which wintering kestrels and Red-tailed Hawks frequented various habitats found in Madison County.

## Study Area and Methods

Madison County encompasses parts of 4 physiographic regions in central Kentucky: the Hills of the Bluegrass, the Outer Bluegrass, the Knobs Section of the Cumberland Plateau, and the Mountains (Soil Conservation Service 1973). Terrain ranges from rolling, upland plains to long, narrow ridge tops separated by steep valleys with the maximum relief being 335 m (Jillson 1928). Madison County is composed predominantly of pastureland and hayfields with forest stands being confined mainly to stream margins, field edges, and rugged regions of the Cumberland Plateau and Mountains.

Birds were located by means of an automobile road count (Craighead and Craighead 1956) covering secondary roads of the county. The count routes were chosen so that each of the physiographic regions in the county were represented. One road count was run weekly from late December 1980 to March 1981 for a total of 10 counts. Each covered the same 235 km and were not run when visibility was hampered by snow, fog, or rain. A driver/observer and passenger/observer were present during each census. Routes were driven at speeds between 32-48 kph, and all raptor sightings on both sides of the road were recorded. The maximum distance of sightings on each side of the road was approximately 440 m.

Habitats directly beneath raptors in flight, and areas overlooked by perched birds formed the basis for determining species-specific habitat utilization. Six habitat categories were distinguished: pastureland (both grazed pasture and mowed hayfields), cropland, urban areas, old fields, woodlots and plowed fields. Actual habitat use was tested against their relative occurrence. Proportion of occurrence was quantified from randomly selected aerial photographs representing 10% of the entire county.

## Results and Discussion

The six habitat types occurred in the following proportions: 57% pastureland and hayfields, 33% woodlots, 3% cropland, 3% urban areas, 2% old fields and 2% plowed fields. Kestrels and Red-tailed Hawks utilized certain habitats to a greater extent than that predicted by their relative availability. Chi-square ($\chi^2$) tests showed significant non-random habitat use by kestrels and Red-tailed Hawks wintering in Madison County (Table 1).

Table 1. Results of Chi-square ($\chi^2$) analysis of habitat selection and utilization based on habitat availability in Madison county.

| Species | $\chi^2$ |
|---|---|
| American Kestrel | 629.5[a] |
| Red-tailed Hawk | 124.8[a] |

[a] $P < 0.05$; d.f. = 5

Table 2. Total number of American Kestrel and Red-tailed Hawk sightings and % deviation from expected Chi-square values for their occurrence in each of 6 habitat types. A positive sign indicates habitat use greater than expected and a negative sign indicates use less than expected.

| | American Kestrels | | Red-tailed Hawk | |
|---|---|---|---|---|
| Habitat | n | % deviation | n | % deviation |
| Pastureland | 276 | + 38 | 117 | + 28 |
| Old Field | 66 | +790 | 21 | +525 |
| Cropland | 15 | + 76 | 1 | − 59 |
| Plowed Fields | 5 | − 31 | 1 | − 70 |
| Woodlots | 3 | − 98 | 28 | − 65 |
| Urban Areas | 0 | −100 | 0 | −100 |

Kestrels habitat use was as follows: pastureland 76.9%, old field 18.4%, cropland (consisting mainly of corn stubble) 4.2%, plowed field 1.4%, woodlots 0.8% and urban areas 0%. Percent deviations from expected values of the chi-square test showed that kestrels utilized woodlots and urban areas less, and all other habitats more than expected. Selection of old fields was most pronounced (Table 2).

The nature and distribution of perching sites in a given surveyed area probably introduced bias into road count data. In the Texas panhandle, for instance, frequent utilization of woodlots by kestrels (Allan and Sime 1943) could have been directly related to lack of perching sites in open habitat. In Madison County, the majority of kestrels were seen perching on utility lines, many of which run parallel to the census route. On the other hand, birds hidden behind trees, buildings and signs may have resulted in low utilization estimates for woodlot and urban area use.

Winter habitat separation by sexes has been reported as common among kestrels in Texas, California, Arizona, Mexico (Mills 1976; Koplin 1973) and Georgia (Stinson et al. 1981). Chi-square test showed male kestrels were significantly more numerous than females (58% males, $P < 0.05$). However, sex-specific differences in habitat were not significant in Madison County ($P < 0.05$).

Habitat selection by Red-tailed Hawks was as follows: pastureland 69.9%, woodlots 16.7%, old field 12.5%, cropland 0.6%, plowed fields and urban areas 0%. Use of pastureland and old field sites was greater than expected; all other habitats were frequented less than expected (Table 2). The majority of Red-tailed Hawks associated with woodlots were perched along margins overlooking open areas. Similarly, Petersen (1979), using a road count in Wisconsin, found that internal portions of woodlots were seldom used.

Of all habitat types, old field site use by hawks deviated the most from the expected values. Selection for old field sites by kestrels, and to a lesser degree by Red-tailed Hawks, may have been induced by higher prey populations, specifically Meadow Vole (*Microtus pennsylvanicus*). Austing (1964) found Meadow Voles to be staple prey for Red-tailed Hawks during winter months, and vole population density has been suggested as the major factor determining hawk distribution (Bart 1977). Kestrels also depend heavily upon Meadow Voles during winter (Craighead and Craighead 1956). In Madison County, matted vegetation used by voles for runways will not accumulate on intensively grazed pastureland and mowed hayfields, resulting in decreased population density. Old field sites, based on presumed prey density, have the greatest potential for supporting large numbers of wintering kestrels and Red-tailed Hawks.

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**Dept. of Biol. Sci., Eastern Ky. Univ., Richmond, Ky. 40475. Present address: Dept. of Zoology, Mich. State Univ., E. Lansing, Mich. 48824.**

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